

RESEARCH PROJECT SEGMENT

STATE: ALASKA Name: Sport Fish Investigations of Alaska.
Project No: F-5-R-8 Title: Evaluation of the King Salmon Sport Fisheries on the Lower Kenai Peninsula.
Job No: 7-B-2

Period Covered: July 1, 1966 to June 30, 1967

ABSTRACT

A creel census, extending from May 28 through June 12, was conducted on four Kenai Peninsula streams to determine when the area quota of 500 king salmon *Oncorhynchus tshawytscha*, over 50.8 cm (20 inches) in length had been harvested. The season was closed by field announcement on June 13 after the census revealed an observed catch of 316 king salmon. The harvest was sampled for length, age and sex compositions. Five-year-old fish comprised 49.0 and 45.1 percent, respectively, of the samples from the Anchor and Ninilchik Rivers.

Of 8,853 king salmon punch cards issued in the Cook Inlet area, 77.2 percent were voluntarily returned. Projection of these data indicates an estimated catch of 575 king salmon from the Kenai Peninsula. Catches from the Anchor and Ninilchik Rivers constituted 88 percent of the area harvest.

Escapement indices were determined by foot surveys for Anchor River, Ninilchik River and Deep Creek. The Anchor River spawning population was estimated to be 1,325 king salmon.

RECOMMENDATIONS

1. It is recommended that the study be expanded to investigate population trends and fishing success for anadromous fish species in the major recreational waters of the southwestern Kenai Peninsula and Kachemak Bay.
2. It is recommended that a sampling program be initiated to determine whether the success rate differs significantly between reporting (punch card returns) and non-reporting king salmon anglers.
3. It is recommended that king salmon punch cards include information concerning distribution of fishing effort by geographical area (Upper Cook Inlet - Kenai Peninsula).

OBJECTIVES

1. To investigate and measure king salmon population trends and fishing success for the major recreational waters of the lower Kenai Peninsula.
2. To evaluate the effect of management procedures currently applied to these sport fishing waters.
3. To provide recommendations for the management of king salmon in these waters and direct the course of future studies.

TECHNIQUES USED

The Kenai Peninsula king salmon harvest was estimated by creel census and from punch card returns. The census was designed to provide daily catch estimates for each stream open to king salmon angling. A census day started between 2 and 3 a.m. and continued until 11 p.m. Two to four census clerks, depending on fishing effort, patrolled each stream

throughout the day. The Kenai River census was discontinued after the first weekend of the season because of light fishing effort. Anglers were contacted on the stream or at highway access points. The punch card number and name of each successful angler were recorded as part of every interview. Fork lengths, scales and sex data were obtained from the catch whenever possible. A measure of the census coverage was obtained by examining punch cards during succeeding days of the season and by soliciting information from stream-bank anglers concerning king salmon catches that were known to have escaped the census. In addition to the census, the area harvest was also estimated by extrapolating king salmon punch card data.

Spawning escapements were estimated by foot surveys on established index areas ranging from four to eight miles in length. Enumeration was attempted only during sunny weather when visibility was good. An escapement index was computed for the entire spawning population by correlating foot counts with past aerial and ground escapement data.

Cellulose-acetate scale impressions were examined by microprojector for age determinations.

FINDINGS

History

A description of the lower Kenai Peninsula study streams and past information collected on this project are presented in Dingell-Johnson Progress Reports by Dunn (1960), Logan (1961, 1962, 1963) and Engel (1964, 1965).

Since 1964, sport fishing for king salmon has been prohibited in Cook Inlet and its drainages. In April, 1966, the Alaska Board of Fish and Game relaxed this closure in favor of a regulated harvest from selected streams. A quota of 500 king salmon over 50.8 cm (20 inches) in fork length was established for the Kenai Peninsula, with fishing restricted to the Anchor River, Kenai River, Ninilchik River and Deep Creek. In addition, the Board allowed a 250 king salmon harvest from four Upper Cook Inlet streams. A complete analysis of the Upper Cook Inlet fishery is presented by Kubik (1966).

Freshwater king salmon fishing was limited to weekends and holidays commencing May 28 and was to terminate by field announcement upon achieving the quota or on June 26, whichever occurred first. All anglers were required to have a punch card in their possession while fishing for king salmon. A bag limit of one king salmon daily and two per season was in effect. King salmon under 50.8 cm were considered part of the general area bag limit.

Except for areas adjacent to stream mouths, which were defined as fresh water, all salt waters south of the Kenai Peninsula Forelands were opened to king salmon fishing throughout the year. The saltwater bag limit was two king salmon daily, except during the freshwater season when the freshwater limit and punch card system applied.

Harvest

To estimate when the Kenai Peninsula quota was reached, an intensive creel census was conducted on the four streams open to fishing. The census commenced May 28 and remained active each weekend until the season was closed by field announcement on June 13. During the seven days that fishing was permitted, Department personnel observed a harvest of 316 king salmon. The closure was predicated on this harvest plus field observations regarding the degree of census coverage.

Spring run-off patterns appeared to be closely correlated with fishing success. As in the past, the Ninilchik River was the first stream to clear and approach summer flow levels, followed by the Anchor River and then Deep Creek. The glacial Kenai River maintained a nearly stable flow. The consistent weekly catch from the Ninilchik River may in part be attributed to low, clear water throughout the fishing period. Increased catches from the Anchor River were associated with a decreased discharge during the last weekend of the season. Much of the expected effort on Deep Creek was diverted to either the Anchor or Ninilchik Rivers because of the high, turbid stream flow. The Kenai River received very little fishing effort because the main king salmon migration does not occur until July. The daily observed harvest by stream is listed in Table 1.

TABLE 1 - Observed King Salmon Harvest from Kenai Peninsula Streams, 1966.

<u>Stream</u>	<u>5/28</u>	<u>5/29</u>	<u>5/30</u>	<u>6/4</u>	<u>6/5</u>	<u>6/11</u>	<u>6/12</u>	<u>Total</u>
Anchor River	23	14	13	19	15	77	21	182
Ninilchik River	29	16	8	29	7	24	3	116
Deep Creek	4	3	--	--	--	9	2	18
Kenai River	--	--	--	--	--	--	--	---
TOTAL	56	33	21	48	22	110	26	316

Field observations (Table 1) revealed that Saturday catches from the Anchor and Ninilchik Rivers were consistently larger than on Sunday. Although anglers generally left both streams earlier on Sundays, the fishing effort did not differ appreciably either day. A logical explanation for this disparity is that Saturday catches significantly reduced the king salmon populations so that fewer fish were available to Sunday anglers. The possibility also exists that the Saturday fishing pressure altered the behavior of the fish, with the result that they were more reluctant to bite or perhaps moved upstream to protected spawning areas. With the exception of the Kenai River (open throughout), fishing was restricted to the lower two miles of each stream.

King salmon catch estimates were also calculated from 8,853 punch cards that were issued for the two Cook Inlet fisheries (Upper Cook Inlet and Kenai Peninsula). Of the 6,835 (77.2 percent) voluntarily returned cards, 52 percent were from anglers that had fished for king salmon. Returns from anglers who had participated in the fisheries indicated that 17.7 percent were successful. The punch card analysis had the following limitations: (1) distribution of fishing effort could not be measured by geographical area and (2) non-reporting anglers were not sampled to determine whether their success rate differed significantly from reporting anglers.

Extrapolation of the punch card data provided an estimated catch of 575 king salmon (over 50.8 cm) from the Kenai Peninsula. A probable source of error in the above estimate would be that successful anglers were more likely to return cards than were non-successful anglers. If this occurred, then the estimate is biased upward. Incorporating the field-observed but non-reported catch (23) with the reported harvest (444) produced a minimum catch of 467 king salmon. It is assumed that the true harvest lies somewhere between 467 and the projected estimate of 575; likely very near the quota of 500 king salmon. The estimated harvest by stream is presented in Table 2. A catch of 74 king salmon, less than 50.8 cm in length, was also estimated. Distribution of the "jack" catch (12 percent of the total king salmon harvest) could not be determined accurately from punch cards.

TABLE 2 - Estimated King Salmon Harvest from Kenai Peninsula Waters, 1966.

<u>Stream</u>	<u>Punch Card Reported Harvest</u>	<u>Projected Harvest</u>
Anchor River	221	286
Ninilchik River	168	218
Deep Creek	37	48
Kenai River	11	14
Salt Water	7	9
TOTAL	444	575

Successful Kenai Peninsula local anglers and successful out-of-area anglers averaged 1.35 and 1.19 king salmon respectively. Punch card returns indicate that 21.2 percent of the successful anglers caught the seasonal limit.

Population Structure

Catches from the Anchor and Ninilchik Rivers were sampled for age, size and sex compositions. The length-frequency distribution of 174 king salmon (over 50.8 cm) from the Anchor River is shown in Figure 1. Mean lengths for males and females were 77.6 and 89.5 cm respectively. Fish within the 50.8 cm (20-inch) to 63.5 cm (25-inch) interval comprised 17.2 percent of the sample. The male to female sex ratio, including jacks, was 0.9 to 1.

Scales were collected throughout the season from 168 Anchor River king salmon over 50.8 cm in length. Fifteen percent of this sample showed regeneration or poorly defined annuli, so were eliminated from final analysis. A summary of the age and length data by sex is shown in Table 3. Approximately 97 percent of the sample migrated seaward after one winter in fresh water (age I+) while the remainder spent two winters in the stream (age II+). King salmon in their fifth year of life made up 49.0 percent of the catch. Six-year-old fish were second in abundance (37.7 percent) while four-year-old fish comprised the remainder of the sample.

TABLE 3 - Age-Length Frequency Distribution, by Sex, of Sport-Caught King Salmon from the Anchor River, 1966.

Length in Centimeters	Age - Males				Age - Females				Total
	1.2	1.3	1.4	2.3	2.2	1.3	1.4	2.3	
50.0 - 55.9	6								6
56.0 - 60.9	13				1				14
61.0 - 65.9	7								7
66.0 - 70.9	2								2
71.0 - 75.9	1					1			2
76.0 - 80.9		4				5			9
81.0 - 85.9		3	3			15		2	25
86.0 - 90.9		9	1			19	5		34
91.0 - 95.9		6	1	1		5	6	1	20
96.0 - 100.9			3			1	10		14
101.0 - 105.9			4			1	4		9
106.0 - 110.9									
111.0 - 115.9			1						1
TOTAL	29	22	13	1	1	47	27	3	143
PERCENT OF TOTAL	20.3	15.3	9.1	0.7	0.7	32.9	18.9	2.1	100

Figure 2 illustrates the length-frequency distribution of 110 king salmon (over 50.8 cm) from the Ninilchik River. Mean lengths for males (77.8 cm) and females (88.3 cm) were comparable to the size structure of the Anchor River harvest. The percentage (18 percent) of the fish within the 50.8 cm to 63.5 cm interval was also similar to that recorded from the Anchor River. Males, including jacks, dominated the Ninilchik River harvest at a 1.4:1 ratio.

Five- and six-year-old king salmon comprised 45.1 and 32.9 percent, respectively, of the 82 scales that were examined. Ninety-seven percent of this sample migrated to sea in their second year of life. Age classes by length and by sex are presented in Table 4.

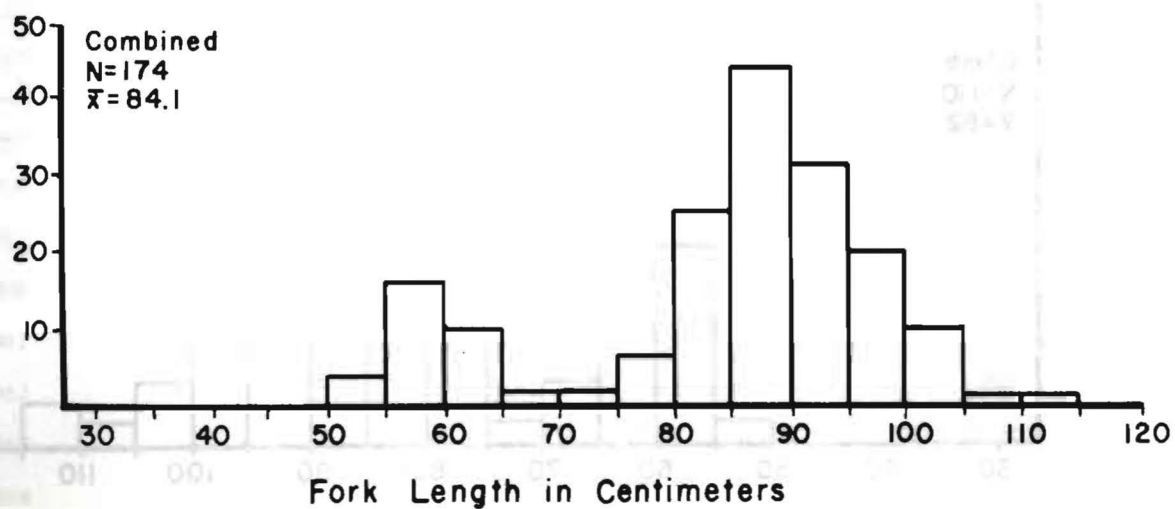
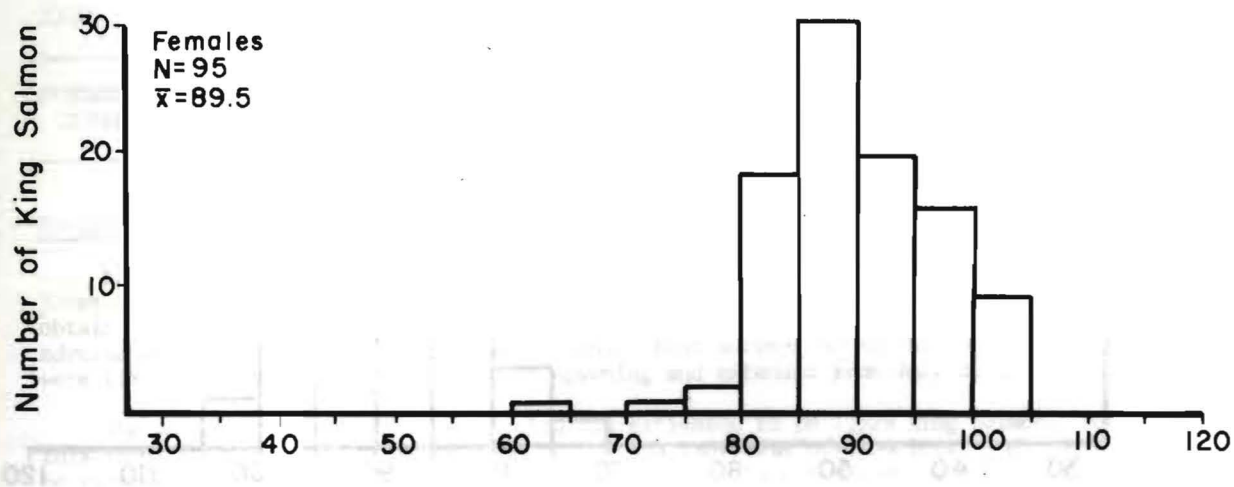
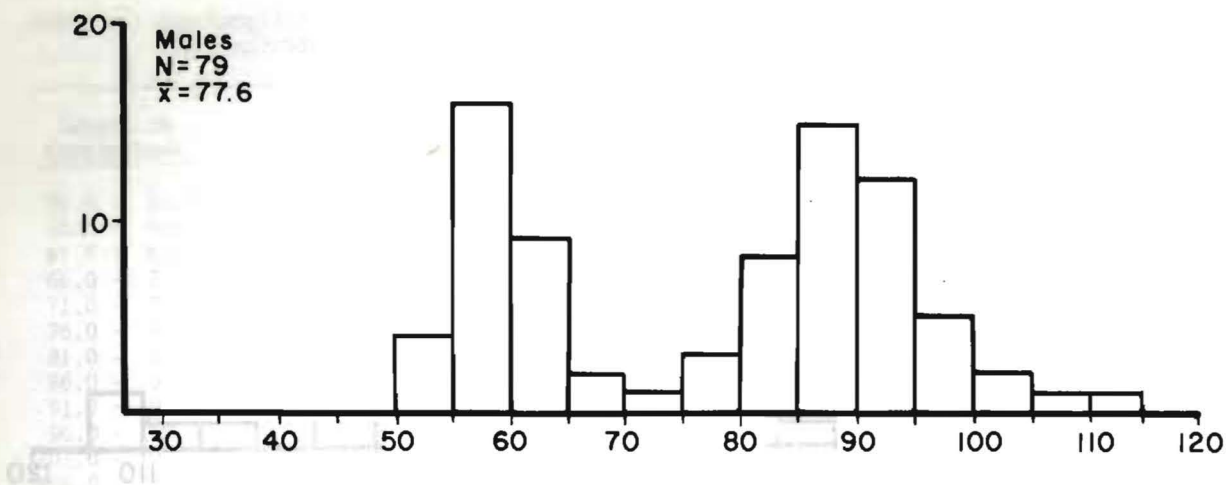


Figure 1. Length Frequency of Sport Caught King Salmon from the Anchor River, 1966.

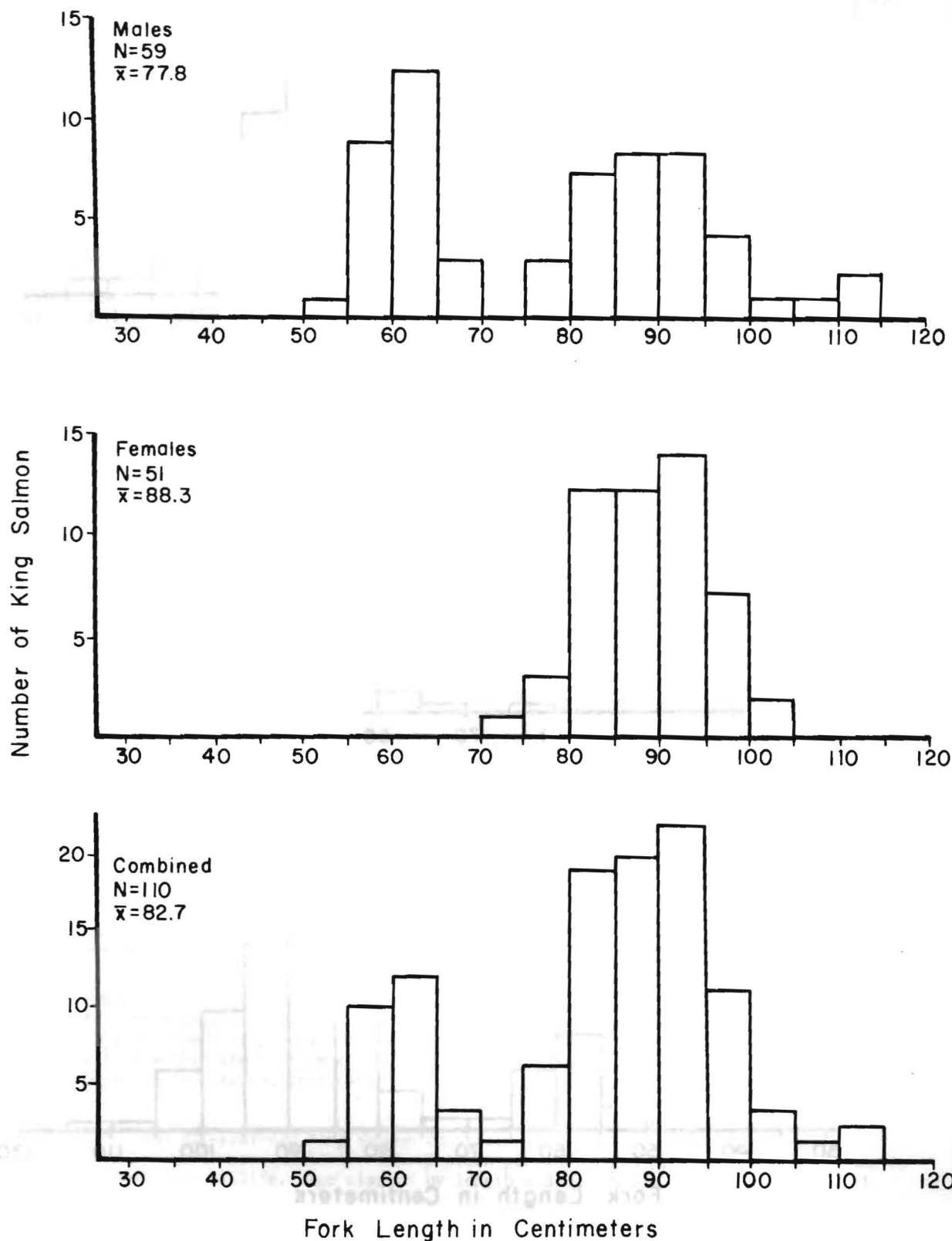


Figure 2. Length Frequency of Sport Caught King Salmon from the Ninilchik River, 1966.

TABLE 4 - Age-Length Frequency Distribution, by Sex, of Sport-Caught King Salmon from the Ninilchik River, 1966.

Length in Centimeters	Age - Males				Age - Females			Total
	1.2	1.3	1.4	2.3	1.3	1.4	2.3	
50.0 - 55.9	1							1
56.0 - 60.9	7							7
61.0 - 65.9	9							9
66.0 - 70.9	1							1
71.0 - 75.9					2			2
76.0 - 80.9		5			3			8
81.0 - 85.9		4	1	1	10		1	17
86.0 - 90.9		7			3	7		17
91.0 - 95.9		1	4		1	6		12
96.0 - 100.9		1				3		4
101.0 - 105.9			1			1		2
106.0 - 110.9			1					1
111.0 - 115.9			1					1
TOTAL	18	18	8	1	19	17	1	82
PERCENT OF TOTAL	22.0	22.0	9.7	1.2	23.2	20.7	1.2	100

Escapement

King salmon escapement information was again collected from Anchor River, Ninilchik River and Deep Creek. In recent years, escapement indices for these streams have been obtained by foot and aerial surveys. In 1966, only ground counts were conducted because adverse weather precluded aerial observations. Foot surveys on established index areas were timed to coincide with the peak of spawning and extended from July 25 through July 28.

The Anchor River spawning population was estimated to be 1,325 king salmon. Although this index is less than those recorded during the two years of the closure, it should not be viewed as a decreased total run because of the added sport harvest. Estimated escapement plus harvest yields an index total (1,611 king salmon) similar to those of the past two years (Table 5). Nearly half the 1966 return, based on a predominance of five-year-old fish, resulted from the 1961 escapement index of 850 king salmon.

TABLE 5 - Estimated Anchor River King Salmon Escapements for Past Years.

Year	Escapement	Method of Determination	Agency
1954	2,700	Weir counts	FWS
1957	2,400	Weir counts	FWS
1960	1,200	Aerial and foot surveys	ADF&G
1961	850	Aerial and foot surveys	ADF&G
1962	970	Aerial and foot surveys	ADF&G
1963	1,340	Aerial and foot surveys	ADF&G
1964	1,700	Aerial and foot surveys	ADF&G
1965	1,600	Aerial and foot surveys	ADF&G
1966	1,325	Foot surveys	ADF&G

The estimated escapements for Deep Creek and the Ninilchik River were less than those in 1964 and 1965 (Table 6). Incorporating the Ninilchik River escapement with the sport catch produces an index total (888 kings) slightly lower than those recorded during the years of the closure. The Deep Creek escapement index was lowest of all estimates during the past five years of observation.

TABLE 6 - Estimated King Salmon Escapements for Deep Creek and the Ninilchik River, 1962-1966.

<u>Stream</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>
Deep Creek	745	605	800	690	540
Ninilchik River	525	450	910	1,025	670

The commercial harvest of 9,604 king salmon was greater than the 1965 catch (8,266) and twice that recorded for Cook Inlet in 1964 (4,622). The majority of these fish are thought to be Kenai Peninsula stocks, bound for the Kenai and Kasilof Rivers.

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